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SOUTHERN CALIFORNIA PATHOLOGICAL LABORATORY AND CITRUS EXPERIMENT STATION.

BY

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The following law was enacted by the California Legislature of 1905:

Statutes and Amendments to the Code.

Chapter CCLXXVIII.

An Act providing for the establishment and maintenance of a pathological laboratory for the investigation of tree and plant diseases and pests, and branch agricultural experiment station, and making an appropriation therefor.

The people of the State of California represented in Senate and Assembly, do enact as follows:

SECTION 1. There shall be established at a point and by means hereinafter provided a scientific station or laboratory with the necessary grounds and buildings; this laboratory shall be equipped with the material and appliances necessary for the study and determination of the cause of diseases and conditions of orchard trees, fruits and vegetables and shall provide the means for a thorough examination of fungus, bacterial, and other maladies, insects, pests, and diseases, and their remedy or prevention, the condition of the soil, cultivation and location that may tend to the imperfect nutrition and all physiological and other defects that may affect the economic production and marketing of horticultural products.

SEC. 2. The location of such pathological laboratory shall be in one of the seven southern counties of the State of California, to be selected by a board of three commissioners hereby created, consisting of the governor of the State, the president of the University of California and the professor of agricultural practice of the University of California, and said board of commissioners is hereby authorized and empowered to select such location, perfect the title thereof in the name of the board of regents of the University of California and do such other acts as may be necessary to make legal the expenditure of the funds required by

the purpose of this act; *provided* that said location may, at the option of the board of commissioners, be on lands already belonging to the State of California at Whittier or Patton.

SEC. 3. When the title to the necessary lands has been perfected by the commission named in section two the regents of the University of California shall proceed to the construction of a building suitable for the protection and use of the laboratory, shall equip the laboratory and maintain it for the purposes designated in the title of this act, and may receive, manage, use, and hold gifts, leases, and bequests for promoting the purposes of this act.

SEC. 4. The board of regents or the president of the University of California, if the regents so authorize, shall select not less than two experts in plant pathology, and such assistants as may be needed, who shall have active charge of the laboratory and the investigations and field experiments, and who shall reside at or near the said laboratory and give their entire time to the investigations required by the board of regents or their representative, and may from time to time publish the results of their inquiries and discoveries; the said board of regents shall fix the salaries of employes and provide for contingent expenses.

SEC. 5. Said commissioners shall also establish and maintain a branch agricultural experiment station or stations under the provisions of this act within the territory described in section two of this act for the purpose of carrying on experimental and investigational work in connection with the agricultural experiment work of the University of California in ascertaining the best methods of horticultural management; for the investigation of fertilization; for the investigation of irrigation; for improving the methods of handling fruits for market; for the introduction of new varieties of fruits and for such other investigations as may be deemed advisable to promote the horticultural interests of said district. Said commissioners may lease or accept gifts of lands for said purpose and may select for the location of said station or stations any lands owned by the state in said district; *provided* that should such station or stations be located upon lands owned by the state at the Whittier Reform School at Whittier or the Southern California State Hospital at Patton they shall not embrace in the aggregate more than fifty acres. Said land shall be supplied with sufficient water for the proper irrigation of the same in any case.

SEC. 6. The regents of the University of California are required to adopt a general plan and schedule before the beginning of each fiscal year which shall describe the investigations and experiments to be pursued during such fiscal year, and it shall be the duty of the board of regents to receive and consider written statements from individuals and associations interested in said branches of horticulture, conveying plans and suggestions for investigations which they may approve or desire.

SEC. 7. The sum of thirty thousand dollars is hereby appropriated out of any money in the state treasury not otherwise appropriated to be expended by the regents of the University of California in carrying out the purposes of this act, and the state controller is hereby authorized and directed to draw his warrant for the same payable to the regents of the University of California, and the treasurer of the state is hereby directed to pay such warrants.

This rather indefinite measure had its origin in two distinct movements which had been gaining ground in southern California for some time. One was a growing realization of the need of some local institution to provide for the investigation of plant diseases, as distinct from insect pests. The increasing prevalence of troubles of this sort, fungus, bacterial, or of unknown nature, and the almost entire lack of definite knowledge concerning them, made most desirable the establishment of some agency for furnishing information along these lines. This demand was most active in the coastward regions where crop production is more varied and plant diseases more prevalent than farther inland.

Another, quite distinct movement, originated in a feeling among citrus growers of the necessity of scientific investigation in connection with the various phases of citrus culture. In the use of fertilizers, improvement of varieties, methods of irrigation and cultivation, study of soil problems, and many other matters, the most foresighted growers foresaw the need of a deeper source of information than their own practical experience.

Regarding the work of the State Agricultural Experiment Station, at Berkeley, which had been by no means inactive along these lines, it was felt that the Station was too far away for the most effective, intensive work, and the State too large for southern California and its industries to receive sufficient attention through ordinary channels. Hence came about, by chance simultaneously, these two efforts to provide local branches of the Station for special work. Two distinct bills were first introduced in the Legislature, which, from their somewhat similar nature, were combined into one, providing literally for at least two separate institutions for the purposes specified.

The members of the Commission designated to locate and establish the "Pathological Laboratory and Branch Experiment Station or Stations," after several visits to southern California and inspection of a number of sites offered for the purpose, decided on the organization of a single institution, with two localized branches: a pathological laboratory at Whittier and a citrus experiment station at Riverside. This segregation was determined on for the convenience of the work, and coincided with the conditions which prompted the original movement.

Near the coast are located the principal sections of walnuts, vegetables, berries, lemons, and other products most threatened with various diseases, and diseases of the same crop are more prevalent here than in the interior. In the latter section is the greatest citrus belt, center-

ing at Riverside, and here is the logical home of any purely citrus institution. Under a single management and control it seemed that the work could be made most effective under this organization.

THE PATHOLOGICAL LABORATORY.

The site selected for this branch consists of about an acre of land in the city of Whittier, at the corner of Greenleaf avenue and Baldwin street, one block beyond the terminus of the Pacific Electric Company's



Fig. 1.—Southern California Pathological Laboratory at Whittier.

trolley line from Los Angeles. This location is easily accessible from all points and in a center of walnut, lemon, vegetable, and berry production. The site was donated by the Whittier Board of Trade through local subscription. Beside the acre of ground belonging to the laboratory, land is available for more extensive plantings on the large farm of the Whittier State School, a State institution close by.

A laboratory building has just been completed at Whittier. This consists of a two-story, frame building of very substantial construction, 40×50 feet, with a shed and green-house annexed. On the lower floor are located the general office, 15×20 feet, library, private office and laboratory, culture storage room, chemical and sterilizing laboratory,

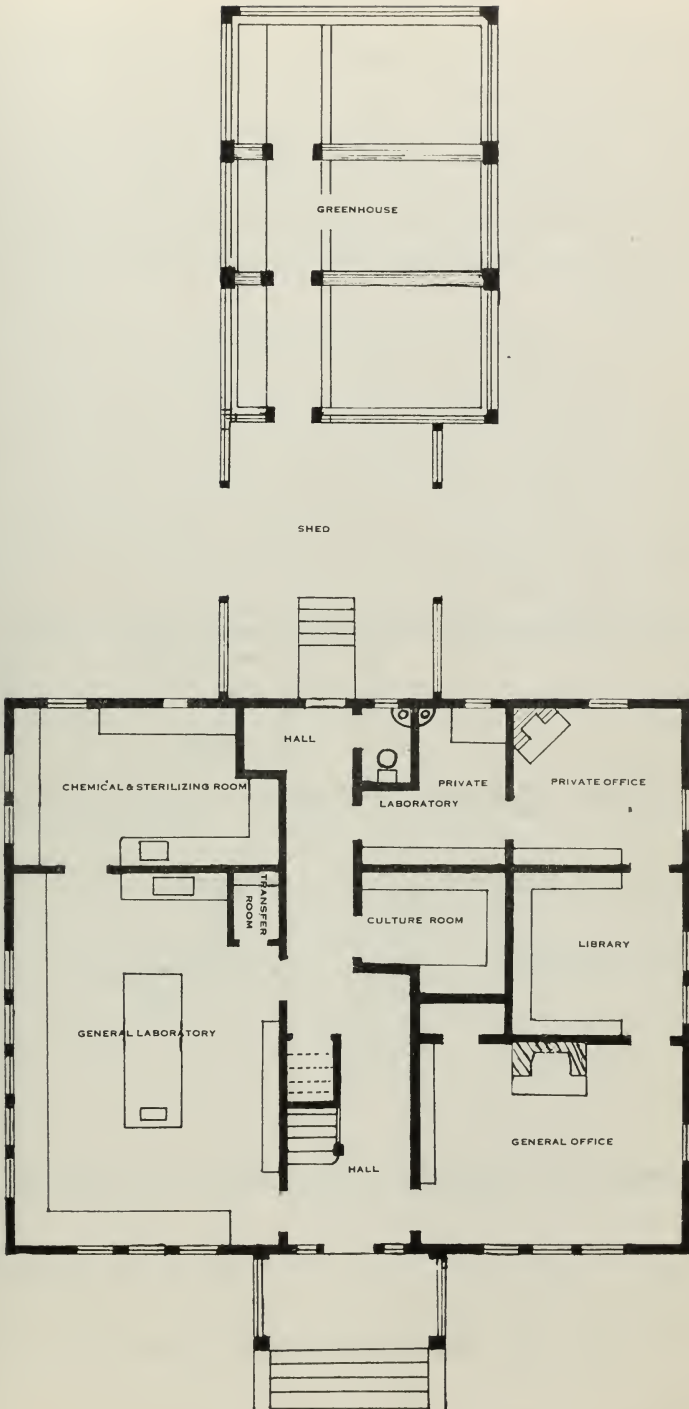


Fig. 2.—First floor, Pathological Laboratory at Whittier.

and a general laboratory, 15×30 feet. The second floor contains a museum, photographic room, entomologist's office and laboratory, private laboratory, and janitor's room. The building has gas, water, and electricity throughout, and is well equipped with furniture, benches and cases, microscopic and culture apparatus, glassware and supplies. It is in every respect a first-class, practical, up-to-date laboratory for its purpose. The green-house consists of three compartments with double glass walls and air space between, and is intended for experimental purposes.

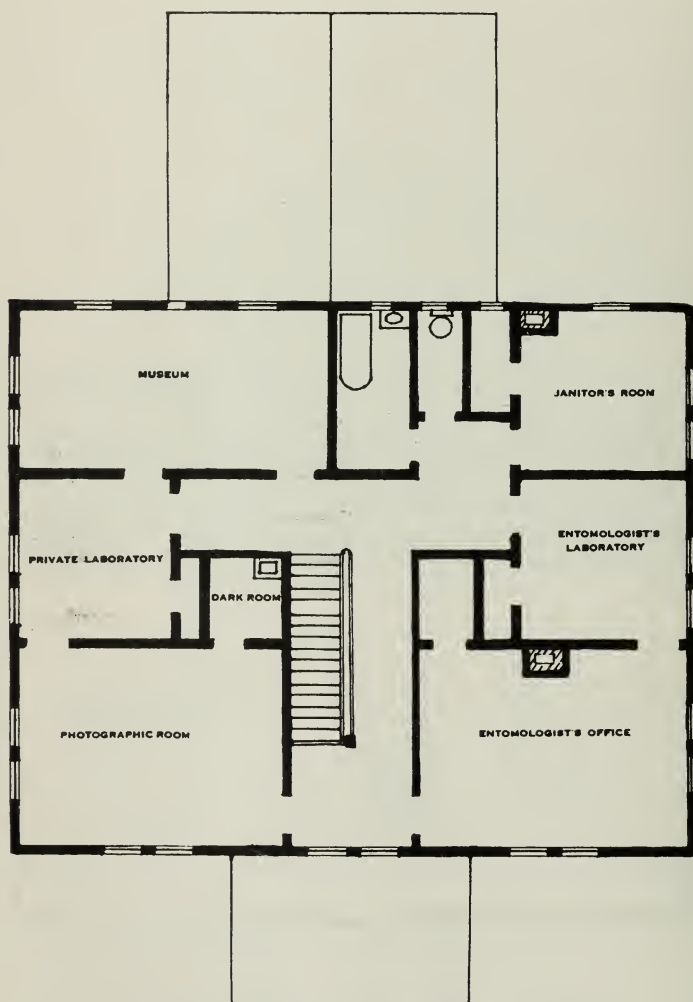


Fig. 3.—Second floor, Pathological Laboratory at Whittier.

The intention is to make the Whittier laboratory a headquarters of investigation in plant pathology, including entomology, for southern California. The study of the various diseases and troubles affecting cultivated plants will receive concentrated attention, both from a technical and practical standpoint. Collections, museum material, etc., will be prepared and the laboratory will be made an object of attraction from a botanical and horticultural standpoint, representing one of the most important extensions of the agricultural work of the University of California.

Opportunities are offered for a limited number of properly prepared graduate or advanced students to avail themselves of the facilities of the laboratory for research, either as candidates for a degree or not. Such students will be governed by the usual regulations of the University of California, concerning which information can be obtained from the Recorder of the Faculties, Berkeley. The laboratory location is practically frostless, affording an agreeable climate and outdoor growth of most plants with slight protection all the year round. Local problems abound in plant pathology and entomology, and the conditions are unexcelled for cultural, life history, histological, ecological and other studies.

The present work of the laboratory is centered largely on problems connected with walnut, citrus, and vegetable growing. Perhaps the most important subject is that of the walnut blight, the serious bacterial disease affecting the English walnut. A large amount of work has been and is being done upon this subject. The most important results to date have been the demonstration of the necessity and the practical value of better cultural operations in walnut production. The industry has grown up rapidly, with little attention to systematic or intensive methods of culture. The present bearing orchards are almost all of seedling trees, of very diverse character and quality. Soil fertilization is unknown, irrigation practice has no system or standards, and cultivation is for the most part superficial and little practiced. Under such conditions the blight has caused much loss, yet its effects are far less than those commonly ascribed to it. The almost entire lack of good cultural practice, now that the earlier planted groves are getting older, is having an even more serious effect.

The only possible direct treatment for blight control appears to be in the line of spraying. After considerable work in this direction by the Pathological Laboratory, as well as by a number of growers, it appears extremely doubtful whether any treatment of this sort can ever be made a practical success. Regardless of the effect on the dis-

ease, the expense and difficulty of thorough spraying on mature walnut trees is so great as to render the general adoption of any possible treatment of this sort extremely doubtful.

The greatest effort at present is therefore being made along the line of improved cultural methods and trees of better quality, in which direction there is much promise of fairly quick results. As regards the tree itself it has already been demonstrated that there are varieties or certain individual trees which are much less affected by the disease than the average seedlings. In the same connection it is necessary that the quality and productive powers of such nuts be demonstrated, as well as their blight resistance. For this purpose an experimental walnut orchard has been started by the laboratory, in which are being grown all obtainable varieties and selected trees. This planting will be most valuable in demonstrating the behavior of the various kinds under local conditions. So far as possible trees of each variety are planted on a variety of root stocks, California Black, Eastern Black, English, etc., while at the same time all these stocks are being grown from seed for experimental plantings. This work tends, naturally, to have its value mostly for future plantings. The problem of regeneration of present orchards is of no less importance. With this in mind the possibilities of top grafting old trees into better kinds are being looked into and demonstrated with considerable promise of good results.

The excellent results of better fertilization, irrigation, and cultivation in walnut orchards, as largely increasing the yield in spite of the disease, are rapidly coming to the front. An important extension of the work of the Pathological Laboratory in this field has been made possible by an arrangement with the Cudahy Ranch, near Los Angeles, through Superintendent John Hund. The large acreage of walnuts on this ranch and liberal attitude of the owner has permitted the laying out and carrying on of fertilizer and irrigation experiments on a scale and over a series of years which would be impossible with an ordinary grower. This work should begin to show important results in the near future. Similar experiments on a smaller scale are being carried on with other groves.

The diseases of citrus trees form an important subject of investigation at the Pathological Laboratory and will soon become the subject of publications.

Diseases of tomatoes, asparagus, and other vegetables are receiving attention in the field and laboratory, along with many other miscellaneous matters.

CITRUS EXPERIMENT STATION.

This branch of the work is located at Riverside, one mile west of the city, at the east base of Rubidoux Mountain, on land furnished by the Huntington Park Association of that place. With the original property and subsequent leases there are now about 30 acres, mostly excellent citrus land, under the Station control. The present buildings



Fig. 4.—Citrus Experiment Station at Riverside.

comprise two cottages and a small stable which were on the original property, and a new work shop and stable just built. A general laboratory and office building will soon be needed. A large reservoir has been built at the upper end of the property, an electric pump installed on the pipe line which runs across the ground, and flumes, pipes, outlets, catch basins, etc., put in for a complete irrigation system.

The purpose of the Citrus Experiment Station, as conceived by its management, is to provide for the State Agricultural Experiment Station adequate facilities for the investigation of all subjects having important bearing on citrus production. For this purpose, as with the pathological laboratory, local initiative is necessary. The most

important problems of the citrus industry at present lie in the direction of the cultural and pomological considerations which have to do with the production and quality of the fruit. To such problems the Station is therefore preparing to give attention.

The necessity of soil fertilization in citrus orchards has brought about an extensive use of fertilizing elements, but with little definite knowledge of specific requirements or effects. This is perhaps the most important cultural problem to-day in California citrus culture. Particularly lacking is information as to the specific effects of the essential elements and most common sources of fertility on the quality of the fruit. Little more is practiced at present than the liberal use of complete fertilizer or its equivalent, stable manure, and nitrogen. To establish a foundation for the desired information, an eight-acre planting has been made at the Station, comprising 20 similar plots each containing Washington Navel and Valencia oranges, Lisbon and Eureka lemons, with the necessary check rows between plots. An irrigation system has been put in by which each plot can be watered separately, and all waste or rain water carried off without running from one plot to another. These 20 plots have been fertilized as follows, and will continue indefinitely with the application of the same substance each year: Plot 1, Nitrate of Soda (Inorganic Nitrogen). Plot 2, Dried Blood (Organic Nitrogen). Plot 3, Sulfate of Potash. Plot 4, Muriate of Potash. Plot 5, Rock Superphosphate. Plot 6, Bone Superphosphate. Plot 7, Raw Bone. Plot 8, Manure. Plot 9, Nitrate of Soda, Dried Blood, Superphosphate, Sulfate of Potash (complete). Plot 10, Nitrogen and Phosphoric Acid (no Potash). Plot 11, Nitrogen and Potash (no Phosphoric Acid). Plot 12, Phosphoric Acid and Potash (no Nitrogen). Plots 13, 14, 15, 16, and 17, are duplicates of 2, 3, 5, 8, and 9. Plots 18, 19, and 20 are Checks, no fertilizer. As these trees develop to bearing age, with the treatment indicated, it is believed that an object lesson will be afforded which will do much toward establishing a firmer basis of knowledge of the specific effects of fertilizing elements on citrus trees. For experiments of the same sort on trees of producing age a 10-acre block of trees adjoining the Station has been leased, and will be devoted to this and other experimental purposes, particularly in relation to the nature, amount, and time of application of fertilizers. The fact is fully realized that results of such experiments at the Station on one type of soil cannot be applied indiscriminately on all soils or in all localities. The idea is rather to demonstrate basic principles in this manner, which may then serve as a foundation for other field trials on a commercial

basis and in various places, in coöperation with growers. The whole matter of fertilizer requirements and practice, and soil composition, structure and treatment must ultimately receive from the Station highly specialized investigations to keep pace with modern progress of knowledge, continuing and extending the previous investigations in this field of Professor Hilgard and his associates of the State Experiment Station.

The character of the tree itself used in planting a citrus orchard is of the greatest importance, and investigations along this line are being undertaken. As regards the kind of root, plantings have been made of the varieties above mentioned, each on various root stocks and on light and heavy soil. Seed beds have also been started of the various species, sweet orange, sour orange, pomelo, and *Citrus trifoliata*. The value of seed from selected trees is also being tested. Concerning the top of the tree a special effort has been commenced for the improvement of present varieties by bud selection from trees of certain peculiarities. A considerable number and variety of buds have been secured during the present season, and propagated in nursery stock. A collection of citrus species and varieties has also been started on the Station grounds.

In general the Citrus Experiment Station will be made a center of investigations relating to the culture of citrus trees. Its activities will by no means be confined to experiments on the Station grounds proper, but will comprise broad investigations of specific problems as related to the citrus industry.

